MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

ECE2046 – COMPUTER ORGANIZATION AND ARCHITECTURE

(TE/EE/CE/NT)

4 JULY 2023
9:00 a.m – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 5 pages including cover page with 5 Questions only.
2. Attempt **ALL** Questions. The distribution of the marks for each question is given.
3. Please print all your answers in the Answer Booklet provided.

Question 1 (25 marks)

(a) With the aid of a diagram, explain the Von Neumann architecture.

[6 marks]

(b) Explain the meaning of computer organization and computer architecture.

[4 marks]

(c) A set associative cache memory consisting of 64 lines is divided into 4-line sets. Main memory contains 4KB blocks of 128 words each. Determine the "tag", "set" and "word" of the main memory addresses with the format.

[10 marks]

(d) Draw a diagram showing an instruction cycle with interrupt.

[5 marks]

Question 2 (17 marks)

(a) With the aid of a diagram, explain the five process states involved in short-term scheduling.

[7 marks]

(b) What is memory swapping, and what is its purpose?

[2 marks]

(c) Give reasons that the page size in a virtual memory system should be neither very small nor very large.

[2 marks]

(d) With the aid of a diagram, explain the types of Queuing scheduling (Queuing representation of processor scheduling) in multiprogramming-based operating system.

[6 marks]

Continued....

Question 3 (17 marks)

(a) Represent (25_{10}) and (-113_{10}) using *16-bit sign-magnitude notation.*

[2 marks]

(b) Use Booth algorithm to multiply 23_{10} (multiplicand) by 19_{10} (multiplier), where each number is represented using 6-bits.

[6 marks]

(c) Add together 26.125_{10} and 40.625_{10} using floating point arithmetic. In each case, show how the numbers would be stored using the IEEE 32-bit floating-point format.

[7 marks]

(d) Store the following fractional numbers using IEEE single precision floating-point format:

$1000\ 0010.0111_2$ [12-bit two's complement fixed-point notation]

[2 marks]

Continued...

Question 4 (25 marks)

(a) Define FOUR (4) types of operands in the context of computer instruction.

[4 marks]

(b) Write an assembly program for a three-address machine to compute the equation below:

$$\mathbf{Z = (A + B \times C) / ((D - E \times F) + G)}$$

[6 marks]

(c) A control unit is made up of numerous inputs and outputs. Answer the following:

(i) Draw a block diagram of the control unit with all its inputs and outputs.

[9 marks]

(ii) List and describe the inputs.

[4 marks]

(iii) List and describe the outputs.

[2 marks]

Continued...

Question 5 (16 marks)

(a) Using a suitable diagram, describe the main difference between pipeline and superpipeline.

[4 marks]

(b) What is True Data dependency?

[2 marks]

(c) Multithreading can be implemented by either time slicing or multiprocessing method. Explain how multithreading can be done in these two methods.

[4 marks]

(d) Flynn's classification of computer architecture is based on the parallelism in the instruction and data streams. State and briefly explain three types of Flynn's classification.

[6 marks]

End of Paper